



Eschweilera compressa (Vell.) Miers (Lecythidaceae): a new record of a threatened plant species in Espírito Santo state, Brazil

Michel Ribeiro^{1*}, Scott Alan Mori², Anderson Alves-Araújo³, Geovane de Souza Siqueira⁴ and Ariane Luna Peixoto⁵

1 Escola Nacional de Botânica Tropical, Rua Pacheco Leão, 2040, Horto, CEP 22460-030, Rio de Janeiro, RJ, Brazil

2 Institute of Systematic Botany, The New York Botanical Garden, Bronx, New York, USA 10458-5126

3 Universidade Federal do Espírito Santo, Centro Universitário Norte do Espírito Santo. Rodovia BR 101 Norte, Km 60, Bairro Litorâneo, CEP 29932-540, São Mateus, ES, Brazil

4 Reserva Natural Vale, Rodovia BR 101, km 122, s/n., CEP 29.909-330, Linhares, Espírito Santo, Brazil

5 Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. Rua Pacheco Leão, 915, Horto, CEP 22460-038, Rio de Janeiro, RJ, Brazil

* Corresponding author: E-mail: mrbeirobio@gmail.com

Abstract: This paper provides the first record of *Eschweilera compressa* (Lecythidaceae) in Espírito Santo state, Brazil. According to IUCN criteria and the Brazilian government, this species is assigned as Critically Endangered globally and Endangered nationally, respectively. Herein, *E. compressa* is regionally assigned as Critically Endangered in Espírito Santo, Brazil, which is justified by urban expansion, a small area of occupancy, as well as its occurrence outside protected areas. A brief description, distribution map, and images of the species are presented.

Key words: Atlantic Forest; sapucaípe; endangered species; tree; conservation

The Atlantic Forest has the fourth highest biodiversity of the 35 global hotspots (Mittermeier et al. 2011). It shelters 17,224 plant species (except algae and cyanobacteria) and 60% of the Brazilian flora that is threatened with extinction (BFG 2015; Costa and Peralta 2015; Prado et al. 2015; Martinelli et al. 2013). It comprises a mosaic of plant communities occurring along the mountain ranges and lowlands paralleling the Atlantic Ocean from the Brazilian state of Rio Grande do Norte to the province of Misiones, Argentina (Leme and Siqueira-Filho 2006). The economic engine of the country is mainly concentrated in the region encompassing the Atlantic Forest, and more than half of the Brazilian population lives in this area (Martinelli et al. 2013). Although national laws provide protection to the Atlantic Forest, threats still persist and only about 11.6% of its original cover remains, which is mostly (83.4%) represented by remnants smaller than 50 ha (Ribeiro et al. 2011; Scarano and Ceotto 2015).

Lecythidaceae has a pantropical distribution and comprises 24 genera and about 350 species. In the Neotropics this group is represented exclusively by subfamily Lecythidoideae that shows greater diversity and dominance in the Amazonian Basin and Guianas forests (Mori 2004). In Brazil, nine genera and 120 species occur, with most in the Amazon domain (BFG 2015, Ribeiro et al. 2016). In the Atlantic Forest, 65% of species are endemic and some have restricted distribution (Mori 1990, 1995; Ribeiro et al. 2016; Smith et al. 2016).

Eschweilera Mart. ex DC., recorded from Veracruz in Mexico to Rio de Janeiro state in Brazil, is the most speciose genus of Lecythidaceae with approximately 89 species divided into three clades (Mori and Prance 1990; Huang et al. 2015). In Brazil, approximately 51 species are recorded: 45 in the Amazon Forest, one from Cerrado, and seven in the Atlantic Forest (BFG 2015, Ribeiro et al. 2016). Among *Eschweilera* species from the Atlantic Forest, it is possible that one also occurs in Amazonian forest (belonging to clade *E. parvifolia*); the other six species are endemic for that domain (belonging to clade *E. tetrapetala*) (Mori and Prance 1990; Mori 1995; BFG 2015).

So far, two species of *Eschweilera* — *E. ovata* (Cambess.) Mart. ex Miers (Cambess. 1829: 378; Miers 1874: 257) and *Eschweilera sphaerocarpa* M. Ribeiro & S.A. Mori (Ribeiro et al. 2016: 267–271) were recorded from the Brazilian state of Espírito Santo. Although several areas in the state are currently considered high priority for biodiversity conservation (Loyola et al. 2014), almost half of the state's area lacks any records of the family due to low effort for sampling, especially in the south (Ribeiro et al. 2014).

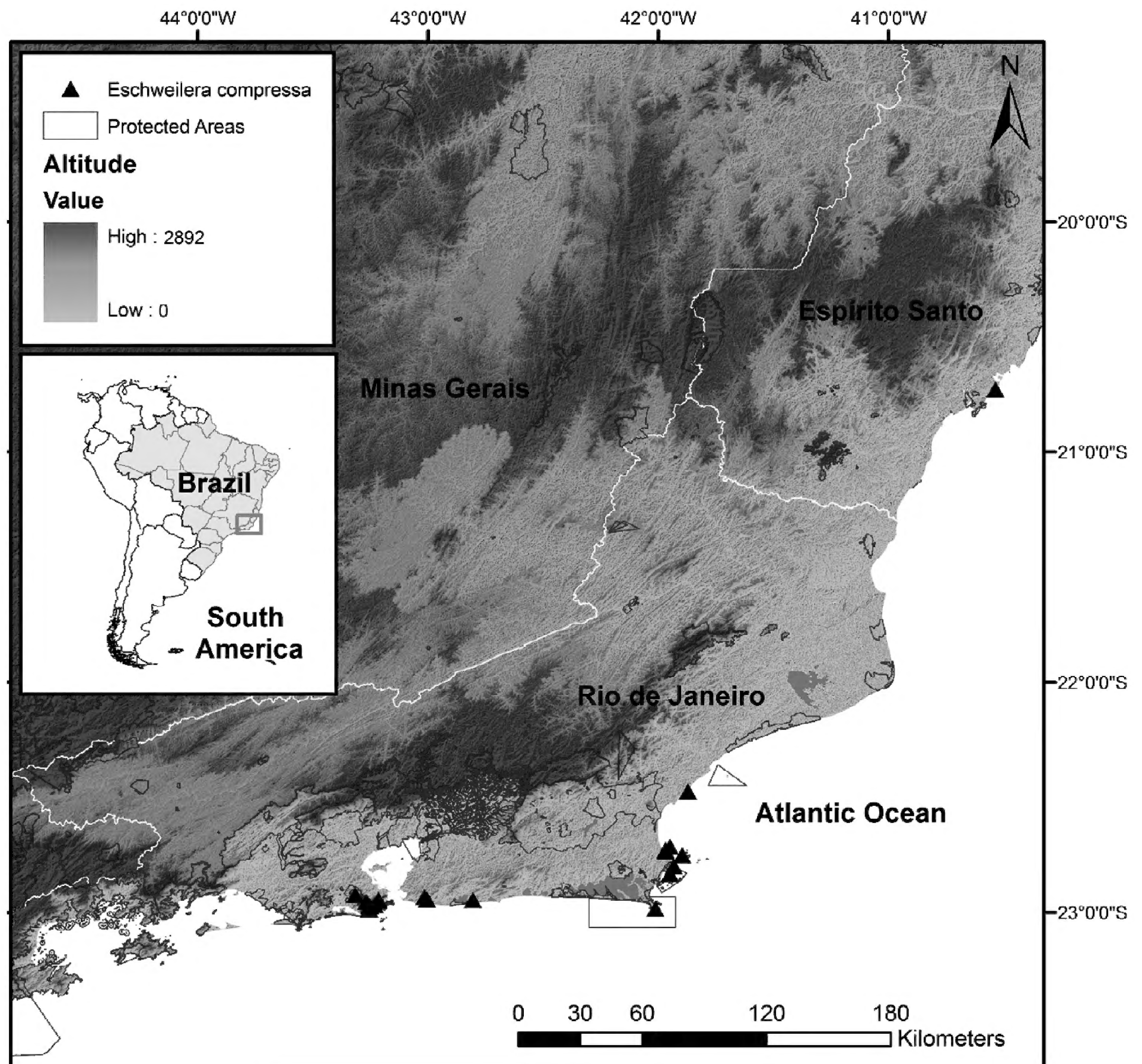


Figure 1. Distribution of *Eschweilera compressa* in Rio de Janeiro and Espírito Santo states. Datum used: WGS84.

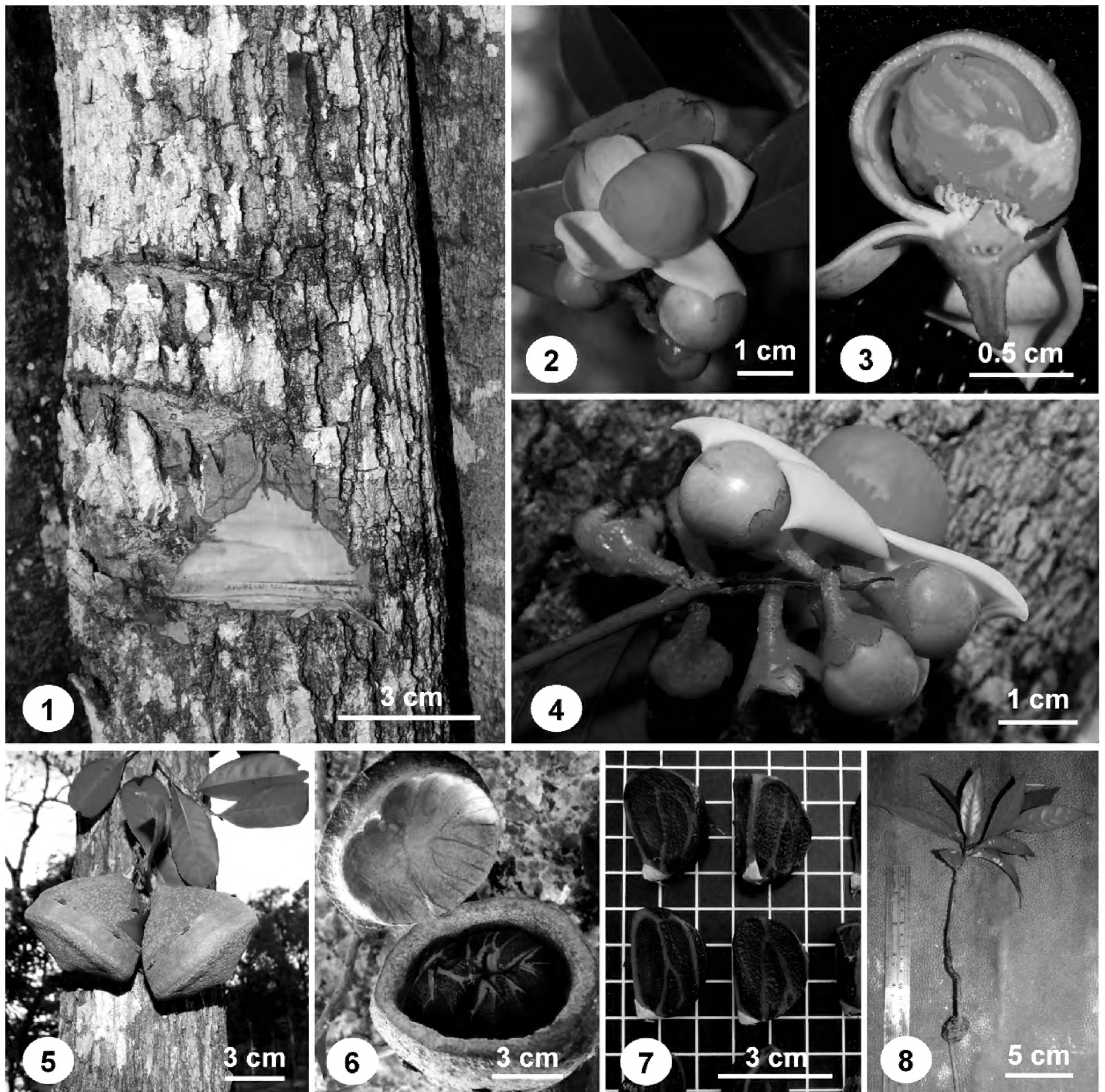
While carrying out fieldwork and studying herbaria for records of Lecythidaceae from Espírito Santo State (part of the project “Flora of the state of Espírito Santo”), some specimens were identified as *Eschweilera compressa* (Vellozo 1829: 222) Miers (Miers 1874: 248) from the municipality of Guarapari (20°43′44.99″ S, 040°32′10.26″ W). These are first records of this species from the state (Figure 1). This paper provides a brief description, distribution map, and images of the species.

The specimens were collected and photographed in the field (Mori and Prance 1987). Vouchers are housed in the Herbarium RB, with duplicates at VIES and NY. Collections such as CEPEC, CVRD, GUA, HUEFS, R, RB, NY, and VIES were also consulted. On-line collections (BM, G, INPA, M, and P) were examined as well (the acronyms following Thiers continuously updated). Terminology for morphological structures follows Mori and Prance (1990), Mori et al. (2010), and Huang

et al. (2015). The geographical distribution map was developed using ArcMap 9.3. Conservation assessments follow IUCN (2014) criteria. Extent of occurrence (EOO) and the area of occupancy (AOO) were estimated using GeoCAT, and AOO is based on 2 × 2 km cell (Bachman et al. 2011).

The identification was performed by consulting specialized bibliography (Mori and Prance 1990).

Eschweilera compressa is a understory tree, up to 12 m tall, bark fissured, the fissures shallow, leaf blades (5.2–)7.5–13.5 × (1.8–)3.7–6.3 cm, elliptic, glabrous, base obtuse, margins serrulate, apex short-acuminate or acute; inflorescence in racemes, glabrous, rachis 1–4 cm long, flowers 3–3.8 cm in diameter, calyx-lobes not imbricated, 4 petals, white, androecial hood with single coil, yellow, the coil has vestigial stamens on the exterior surface and, staminodes and vestigial stamens on the inner surface. Fruits (2.7–)4–6.5 × (3.9–)4.5–7.8 cm, broadly turbinate,



Figures 2–9. *Eschweilera compressa*. **2:** trunk and bark. **3:** flower. **4:** flower in medial longitudinal section. **5:** inflorescence showing detail of the lobes-calyx (2–5 Ribeiro & Bravim 1159). **6:** immature fruits (Ribeiro & Bravim 1158). **7:** mature fruit with seeds. **9:** seeds with aril (7–8 Siqueira & Pretti 1048). **9:** young plant (Ribeiro & Bravim 1160). Photos by M. Ribeiro, except 7 and 8 by G.S. Siqueira.

rare subglobose, brown, operculum umbonate; seeds 2.2–3.3 × 1.6–2 cm, (4–) 6–10 per fruit, aril basal (Figures 2–9).

The species differs from others *Eschweilera* species found in eastern Brazil by its chartaceous leaves with serrulate margins (versus coriaceous leaves with entire margins), inflorescence in short racemes 1–4 cm (versus inflorescence in long racemes or spikes < 5 cm), and fruits with 6–10 seeds (versus fruits less 6 seeds) (Smith et al. 2016).

Previously described under the basionym of *Lecythis compressa* Vell. (Vellozo 1829: 222), *E. compressa* is con-

sidered a rare species of the Brazilian flora (Trovó et al. 2009), and its distribution was thought to be restricted to the state of Rio de Janeiro (where it was known from the municipalities of Rio de Janeiro, Niterói, Maricá, Cabo Frio, Armação de Búzios, and Rio das Ostras; Barbosa 1982; Mori and Prance 1990; Mori 1995; BFG 2015; Venda et al. 2013). The distribution of this species was thought to be restricted to the municipality of Rio de Janeiro until 1972. More specimens (18 samples) were collected only after the 1990s near urban areas, predominantly in protected areas: Tijuca National

Forest, Serra da Tiririca and Costa do Sol State Parks, and Itapebussus Relevant Ecological Interest Area.

Eschweilera compressa is currently found in both Lowland and Submontane Ombrophilous Forests (vegetation classification according to IBGE 2012). Those forests occur near the coast, often on clay sediments up to 300 m altitude, and sometimes approach the shore through cliffs from southern Espírito Santo to the Rio de Janeiro. Floristic and phytosociological studies performed in this region do not record the occurrence of *E. compressa* in dune-ridge forests (*restinga* vegetation) (Menezes and Araujo 2005; Costa and Dias 2001; Araújo et al. 2015; Ribeiro et al. 2014), although the species can be found near the coastal strip.

The new records for the municipality of Guarapari, Espírito Santo, represent an extension of 242 km from the previous records of *E. compressa* (Figure 1). The individuals were found about 20 m above sea level and 700 m away from the shore, in small forest remnants on the Tertiary tablelands, which is one of the three geomorphological provinces in the state. Tertiary tablelands are characterized by planed surfaces and clay sediments originated from Tertiary period (see details in Martin et al. 1993). In the Espírito Santo, *E. compressa* is known from only one site and it is represented by few individuals. EOO and AOO are estimated as 0.026 km² and 4 km², respectively.

Currently, *E. compressa* is assigned as Critically Endangered (O'Brien 1998) and Endangered in the official list of Brazilian endangered flora (MMA 2014). Habitat loss, logging, deforestation, agricultural, livestock activities and, especially urban expansion are historically and currently the threats (Young 2005; Venda et al. 2013). The species is herein categorized as Critically Endangered in Espírito Santo criteria based the IUCN criteria of on small area of occupancy, low number of known records, and individuals occurring outside protected areas (IUCN 2014).

Examined material (abbreviations: fl., flower; fr., fruit; st., sterile): *Eschweilera compressa* — BRAZIL. ESPÍRITO SANTO: Guarapari, Meaípe, small farm of the Mr. Marcio E. Pretti, fr., 27-XII-2014, G.S. Siqueira 1048 & M.E. Pretti (CVRD 15206, HUEFS 214540, RB 631137); idem, 27-XII-2014, fl., G.S. Siqueira 1055 & M.E. Pretti (CEPEC 149323, CVRD 15231); Guarapari, Nova Guarapari, 30-IV-2015, fr., M. Ribeiro 1157 & F. Bravim (RB 648664); idem, 30-IV-2015, fr., M. Ribeiro 1158 & F. Bravim (RB 648665); ibidem, 30-IV-2015, fl., fr., M. Ribeiro 1159 & F. Bravim (RB 648666); idem, 30-IV-2015, st., M. Ribeiro 1160 & F. Bravim (RB 648667).

Additional examined material: BRAZIL. Without locality, without date, fl., L. Riedel s.n. (M 0146529, photograph); without locality, 1816–1821, fl., A. de Saint-Hilaire s.n. (P 4543463, photograph); without locality, 1838, fl., J.B.E. Pohl s.n. (M 0146526, photograph); without locality, 1838, fl., J.B.E. Pohl s.n. (M 0146527, photograph); without locality, 1838, fl., J.B.E. Pohl s.n. (M 0146528, photograph). RIO DE JANEIRO: without locality, 1859, fl., G.H. von Langsdorff s.n. (NY 390609); Armação de Búzios, road to Búzios, cliffs of Praia Rosa, 26-V-1995, fl., P.R. Farág 44 (RB 432092); idem, José Gonçalves Farm, 21-I-1997, fl., P.R. Farág 339 (RB 396100); ibidem,

Tartaruga, 13-XII-2003, st., H.G. Dantas 59 (RB 414080); idem, Praia Gorda, 29-VIII-2003, st., H.G. Dantas 320 (RB 414079); ibidem, Barra de Una, 01-VIII-2003, fr., H.G. Dantas 599 (RB 414081); Cabo Frio/Búzios, Condomínio Litoral, 19-VI-1997, fr., A. Lobão 252 (RB 432090); idem, Conglomerado, 29-X-2013, fr., L.B. Pimentel s.n. (RB 591925); ibidem, Mata do Centrinho, Baía Formosa, 25-VI-1993, fr., H.C. Lima 4713 (RB 432079); idem, Tambor Farm, 19-VIII-2003, fr., G.S.Z. Resende 207 (RB 429858); Corcovado, without date, fr., Naudeaud s.n. (P 4543464, photograph); Guanabara, Mata do Rumo, 28-V-1972, fr., D. Sucre 9158 (RB 153817, INPA 46170, NY 390611); Maricá, without date, fr., Mattos s.n. (BM 953875, photograph); idem, Ponta do Fundão, margin of the Barra Lagoon, 20-XII-1995, fl., M.C.L. Ramos 1044 (GUA 46273); idem, 11-XII-1996, fl., fr., M.C.L. Ramos 1772 (RB 328097); ibidem, 26-VI-1996, fr., M.C.L. Ramos 1286 (GUA 46489); idem, APA Restinga between Itaipuaçu-Marica, 06-IV-2012, fl., M.L. Guedes, 19542 (R 213863). Niterói, Serra da Tiririca State Park, Morro do Telégrafo, 10-I-2006, fl., Barros, A.A.M. 2526 (RB 492716); idem, 10-III-2012, fl., A.A.M. Barros 4530 (RB 570178); Rio de Janeiro, without date, fl., A. Saint-Hilaire s.n. (P 01900071, photograph); Rio de Janeiro, Estrella Mountain, without date, fl., C.F.P. von Martius 61 (G 00369094, INPA 75852); Rio de Janeiro, s.n-V-1920, Ducke s.n. (RB 16205); Rio de Janeiro, Guanabara, Sumaré, 14-VIII-1963, fr., C. Monnenat s.n. (GUA 02768); Rio de Janeiro, Cosme Velho, climb to the Corcovado, Morro Cerro-Corá, 18-III-1998, fl., H.C. Lima 5552 (RB 328011); Rio de Janeiro, Gávea, 17-VIII-1945, fr., A.C. Brade s.n. (RB 135163); Rio de Janeiro, Mata da Gávea, 18-II-1927, fl., Pessoal do Horto Florestal s.n. (RB 136149); Rio de Janeiro, Horto Florestal, 12-IV-1927, fr., J.G. Kuhlmann 367 (RB 136150); Rio de Janeiro, Matas do Corcovado, 5-X-1946, st., A.P. Duarte 340 (INPA 46194, RB 59317); Rio de Janeiro, Mata da Pedra do Marinheiro (Jardim Botânico Forest Reserve), 18-I-1969, fl., D. Sucre 4423 (INPA 96773, RB 141118); idem, 09-II-1994, fl., R. Marquete 1459 (RB 304708); Rio de Janeiro, Mons. Flamengo, 1984, fr., without collector (BM 953874, photograph); Rio de Janeiro, forest near the Vista Chinesa, Estrada D. Castorina, 17-I-1949, fl., E. Pereira 619 (NY 682476, RB 64925, INPA 46193); Rio de Janeiro, Jacarepaguá, Três Rios, 24-VI-1956, fl., fr., Liene 3895 (RB 107999, INPA 46192); Rio de Janeiro, Tijuca, small wood at the base of Conde Rock, s.n.-II-1929, fl., without collector (RB 21530); idem, s.n.-II-1929, fl., P. Occhioni s.n. (INPA 46191, photograph); Rio de Janeiro, forest of the Aliança Factory, Laranjeiras, 29-XI-1927, fl., J.G. Kuhlmann 367 (RB 136148); Rio de Janeiro, Laranjeiras, 20-I-1870, fl., A.F.M. Glaziou 3980 (R 8990); Rio das Ostras, Restinga de Praia Virgem, 14-III-2000, fl., Braga, H.N. 883 (R); idem, ARIE Itapebussus, s.n.-VII-2004, st., A.E.S. Oliveira 1074 (RB 432565).

ACKNOWLEDGEMENTS

We thank the herbarium curators for access to their collections, Marcio E. Pretti for allowing the collection of specimens on their property, and Fabrício Bravim for help with fieldwork. The Sistema Nacional de Pesquisa em Biodiversidade (SISBIOTA) supported our fieldwork and the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) granted a scholarship to the first author. The National Science Foundation (OPUS DEB-1119712) and the Mohammed bin Zayed Conservation Fund supported the study of the second author.

LITERATURE CITED

Araujo, D.S.D., C.F.C. Sá, V.S. Fonseca-Kruel, M.C.A. Pereira, N.C. Maciel, R.C. Sá, A.D. Araujo, G. Kruel, L.R. Andrade and O.J. Pereira. 2015. Restinga net. Accessed at <http://www.restinga.net/flora.asp>, 7 January 2016.

- Bachman, S., J. Moat, A.W. Hill, J. la Torre and B. Scott. 2011. Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. *ZooKeys* 150: 117–126. doi: 10.3897/zookeys.150.2109
- Barbosa, M.R.V. 1982. Lecythidaceae do Parque Nacional da Tijuca. *Cadernos Técnicos Feema. Série de Trabalhos Técnicos* 1: 9–16.
- BFG (The Brazil Flora Group). 2015. Growing knowledge: an overview of Seed Plant diversity in Brazil. *Rodriguésia* 66(4): 1085–1113. doi: 10.1590/2175-7860201566410
- Cambessèdes, J. 1829. *Flora Brasiliae Meridionalis* (quarto ed.) v. 2. Paris: A Belin Bibliopolam. 381 pp. <http://www.biodiversitylibrary.org/page/31620033>
- Costa, A.F. and I.C.A. Dias. 2001. Flora do Parque Nacional da Restinga de Jurubatiba e arredores, Rio de Janeiro, Brasil: listagem, florística e fitogeografia: angiospermas, pteridófitas, algas continentais. Rio de Janeiro: Museu Nacional. 200 pp.
- Costa, D.P. and D.F. Peralta. 2015. Bryophytes diversity in Brazil. *Rodriguésia* 66(4): 1063–1071. doi: 10.1590/2175-7860201566409
- Huang, Y.-Y., S.A. Mori and L.M. Kelly. 2015. Toward a phylogenetic-based Generic Classification of Neotropical Lecythidaceae — I. Status of *Bertholletia*, *Corythophora*, *Eschweilera* and *Lecythis*. *Phytotaxa* 203(2): 85–121. doi: 10.11646/phytotaxa.203.2.1
- IBGE (Instituto Brasileiro de Geografia e Estatística). 2012. Manual Técnico da Vegetação Brasileira, 2° ed. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística. 275 pp. Accessed at ftp://geoftp.ibge.gov.br/documentos/recursos_naturais/manuais_tecnicos/manual_tecnico_vegetacao_brasileira.pdf, 20 February 2016.
- IUCN (International Union for the Conservation of Nature Standards and Petitions Subcommittee). 2014. Guidelines for using the IUCN Red List categories and criteria. Version 11. Gland: International Union for the Conservation of Nature. 87 pp. Accessed at <http://jr.iucnredlist.org/documents/RedListGuidelines.pdf>, 18 February 2016.
- Leme, E.M.C. and A.J. Siqueira-Filho. 2006. A Mata Atlântica: aspectos gerais; pp. 47–80, in: A.J. Siqueira-Filho and E.M.C. Leme (eds.). *Fragmentos de Mata Atlântica do Nordeste: biodiversidade, conservação e suas bromélias*. Rio de Janeiro: Andrea Jakobsson Estúdio.
- Loyola, R., N. Machado, D. Vila-Nova, E. Martins and G. Martinelli. 2014. Áreas prioritárias para a conservação e uso sustentável da flora brasileira ameaçada de extinção. Rio de Janeiro: Andrea Jakobson Estúdio and Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. 80 pp.
- Martin, L., K. Suguiu and J.M. Flexor. 1993. As Flutuações do Nível do Mar durante o Quaternário Superior e a Evolução Geológica de Deltas Brasileiros. *Boletim Instituto de Geociências da Universidade de São Paulo, São Paulo, Publicação Especial* 15. 186 pp. <http://ppegeo.igc.usp.br/pdf/bigsp/n15/n15a02.pdf>
- Martinelli, G., A.S.M. Valente, D. Maurenza, C. Kutschenko, D.M. Judice, D.S. Silva, E.P. Fernandez, E.M. Martins, F.S.M. Barros, J.C. Sfair, L.A.F. Santos-Filho, M.B. Abreu, M.A. Moraes, N.P. Monteiro, P.V. Pietro, R.A. Fernandes, R.L.O. Hering, T. Messina and T.S.A. Penedo. 2013. Avaliação de risco de extinção de espécies da flora brasileira; pp. 60–84, in: G. Martinelli and M.A. Moraes (orgs.). *Livro vermelho da flora do Brasil*. Rio de Janeiro: CNC Flora, Instituto de Pesquisas Jardim Botânico do Rio de Janeiro and Andrea Jakobsson Estúdio.
- Menezes, L.F.T. and D.S.D. Araújo. 2005. Formações vegetais da restinga da Marambaia, Rio de Janeiro; pp. 67–120, in: L.F.T. Menezes, A.L. Peixoto and D.S.D. Araújo (eds.). *História natural da Marambaia*. Seropédica: EDUR.
- Miers, J. 1874. On the Lecythidaceae. *Transactions of the Linnean Society of London* 30(2): 157–318. <http://www.biodiversitylibrary.org/page/27558070>
- Mittermeier, R.A., W.R. Turner, F.W. Larsen, T.M. Brooks and C. Gascon. 2011. Global biodiversity conservation: the critical role of hotspots; pp. 3–22, in: F.E. Zachos and J.C. Habel (eds.). *Biodiversity hotspots*. London: Springer Publishers. doi: 10.1007/978-3-642-20992-5_1
- MMA (Ministério do Meio Ambiente). 2014. Portaria MMA nº 443. Lista Nacional Oficial de Espécies da Flora Ameaçadas de Extinção. Accessed at http://cncflora.jbrj.gov.br/portal/static/pdf/portaria_mma_443_2014.pdf, 20 February 2016.
- Mori, S. 1990. Diversificação e conservação das Lecythidaceae neotropicais. *Acta Botanica Brasilica* 4(1): 45–68. doi: 10.1590/S0102-33061990000100004
- Mori, S.A. 1995. Observações sobre as espécies de Lecythidaceae do leste do Brasil. *Boletim de Botânica, Universidade de São Paulo* 14: 1–31. doi: 10.11606/issn.2316-9052.v14i0p1-31
- Mori, S.A. 2004. Lecythidaceae; pp. 207–209, in: N. Smith (ed.). *Flowering plants of the Neotropics*. New Jersey: Princeton University Press.
- Mori, S.A. and G.T. Prance. 1987. A guide to collecting Lecythidaceae. *Annals Missouri Botanical Garden* 74: 321–330. doi: 10.2307/2399402
- Mori, S.A. and G.T. Prance. 1990. Lecythidaceae — Part II. The zygomorphic-flowered New World genera (*Couroupita*, *Corythophora*, *Bertholletia*, *Couratari*, *Eschweilera*, & *Lecythis*). *Flora Neotropica* 21: 1–375.
- Mori, S.A., N.P. Smith and G.T. Prance. 2010. Lecythidaceae glossary. The Lecythidaceae pages. New York: The New York Botanical Garden. Accessed at <http://sweetgum.nybg.org/lp/index.php>, 12 December 2015.
- O'Brien, J. P. 1998. *Eschweilera compressa*. The IUCN Red List of threatened species 1998. Gland: International Union for the Conservation of Nature. doi: 10.2305/IUCN.UK.1998.RLTS.T35517A9937012.en
- Prado, J., L.S. Sylvestre, P.H. Labiak, P.G. Windisch, A. Salino, I.C.L. Barros, R.Y. Hirai, T.E. Almeida, A.C.P. Santiago, M.A. Kieling-Rubio, A.F.N. Pereira, B. Øllgaard, C.G.V. Ramos, J.T. Mickel, V.A.O. Dittrich, C.M. Mynssen, P.B. Schwartzburd, J.P.S. Condack, J.B.S. Pereira and F.B. Matos. 2015. Diversity of ferns and lycophytes in Brazil. *Rodriguésia* 66(4): 1073–1083. doi: 10.1590/2175-7860201566410
- Ribeiro, M.C., A.C. Martensen, J.P. Metzger, M. Tabarelli, F.R. Scarano and M.J. Fortin. 2011. The Brazilian Atlantic Forest: a shrinking biodiversity hotspot; pp. 405–434, in: F.E. Zachos and J.C. Habel (eds.). *Biodiversity hotspots*. Heidelberg: Springer.
- Ribeiro, M., S.A. Mori, A. Alves-Araújo and A.L. Peixoto. 2014. State of knowledge of Lecythidaceae in Espírito Santo state, Brazil. *Boletim do Museu de Biologia Mello Leitão (N. Sér.)* 36: 63–84.
- Ribeiro, M., S.A. Mori, A. Alves-Araújo and A.L. Peixoto. 2016. A new species of *Eschweilera* (Lecythidaceae) from the Brazilian Atlantic Forest. *Phytotaxa* 255(3): 267–273. doi: 10.11646/phytotaxa.255.3.8
- Scarano, F.R. and P. Ceotto. 2015. Brazilian Atlantic forest: impact, vulnerability, and adaptation to climate change. *Biodiversity and Conservation* 24: 2319–2331. doi: 10.1007/s10531-015-0972-y
- Smith, N.P., S.A. Mori, W. Law and M. Ribeiro. 2016. Conservation assessment of Lecythidaceae from eastern Brazil. *Kew Bulletin* 71: 14. doi: 10.1007/S12225-016-9627-8
- Thiers, B. [continuously updated]. Index herbariorum: a global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. New York: New York Botanical Garden. Accessed at <http://sweetgum.nybg.org/science/ih/>, 18 June 2016.
- Trovó, M., M.J.G. Andrade, N. Smith and S.A. Mori. 2009. Lecythidaceae; pp. 208–211, in: A.M. Giuletta, A. Rapini, M.J.G. Andrade, L.P. Queiroz and J.M.C. Silva (orgs.). *Plantas raras do Brasil*. Belo Horizonte: Conservação Internacional.

- Vellozo, J.M.C. 1829. *Floræ fluminensis, seu, descriptionum plantarum praefectura Fluminensi sponte nascentium liber primus ad systema sexuale concinnatus; Augustissimæ dominæ nostrae per manus....* Flumine Januario [Rio de Janeiro]: Typographia Nationali. 352 pp. doi: <http://dx.doi.org/10.5962/bhl.title.745>
- Venda, A.K.L., N.P. Smith, D.M. Judice, T.S.A. Penedo and P.V. Prieto. 2013. Lecythidaceae, pp. 607–611, in: G. Martinelli and M.A. Moraes (orgs.). *Livro Vermelho da flora do Brasil*. Rio de Janeiro: CNC Flora, Andrea Jakobsson and Instituto de Pesquisas Jardim Botânico do Rio de Janeiro.
- Young, C.E. 2005. Causas socioeconômicas do desmatamento da Mata Atlântica brasileira; pp. 103–118, in: C. Galindo-Leal and I.G. Câmara (eds.). *Mata Atlântica: biodiversidade, ameaças e perspectivas*. Belo Horizonte: Fundação SOS Mata Atlântica and Conservação Internacional.
- Author contributions:** GSS and MR collected the species and field data; MR, ALP, SAM and AAA compiled the data and wrote the text, and AAA and SAM made the correction of translation into English.
- Received:** 27 April 2016
Accepted: 2 August 2016
Academic editor: Mayara Caddah